



BAY AREA  
AIR QUALITY  
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DISTRICT

# Preliminary Analysis of PM<sub>2.5</sub> Values With and Without Wildfire Smoke Episodes in 2017 and 2018

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Meteorology and Measurement Division  
Ambient Air Quality Analysis Section

# Description of Preliminary Analysis Methodology

The following analysis represents a preliminary “back of the envelope” assessment of the effects of wildfire smoke episodes in 2017 and 2018 on 2015-2017, 2016-2018, and 2017-2019 24-hour and annual design value calculations to compare PM<sub>2.5</sub> levels with and without the impact of wildfire emissions to the 24-hour and annual National Ambient Air Quality Standards (NAAQS).

The plots and tables included in the analysis do not represent a robust account of wildfire effects on ambient PM<sub>2.5</sub> concentrations nor does it follow EPA’s conventions for data handling for exceptional event demonstrations.

For every Air District monitoring site, all PM<sub>2.5</sub> data were removed from the “no fire” dataset during specific periods during 2017 and 2018 (see Table 1) when *any* monitoring site recorded a 24-hour average of at least 35.5 µg/m<sup>3</sup> when wildfire smoke was present. However, we know that on some of these days, some sites had little or no smoke impacts, but in these cases with this approach, the data was still removed. Likewise, some days had significant smoke impacts without any site exceeding the NAAQS, and these days remain in the “no fire” dataset. Due to this simplified method of screening and removing data, it is likely that this analysis may underestimate and/or overestimate the influence of wildfire smoke episodes on recent 24-hour or annual design value concentrations at a given monitoring site.

Also, design values calculated in this analysis only include data from FEM analyzers and do not follow EPA data handling requirements for site combination at monitoring sites with both FEM and FRM data and, therefore, may not match official design values calculated by EPA.

Finally, the analysis is limited to wildfire smoke episodes in 2017 and 2018. Wildfire-affected data from previous years were not removed from the data set. The District is currently developing an appropriate, comprehensive accounting of current and historical effects of wildfire smoke episodes on Bay Area PM<sub>2.5</sub> concentrations. We currently are planning for this analysis to be complete in mid 2021, after the 2020 air monitoring dataset is finalized.

# Summary of Data Removed from “no fire” Dataset

Table 1: Date Ranges for Data Removal in “no fire” Dataset

Year	Date Range	Wildfire(s)
2017	9/1/2017 – 9/4/2017	Northern California Fires (e.g. Pier, Eclipse Complex, Helena fires)
2017	10/9/2017 – 10/18/2017	North Bay Fires (e.g. Tubbs, Nuns, Atlas fires)
2018	8/23/2018 – 8/24/2018	Mendocino Complex Fires
2018	11/8/2018 – 11/21/2018	Camp Fire



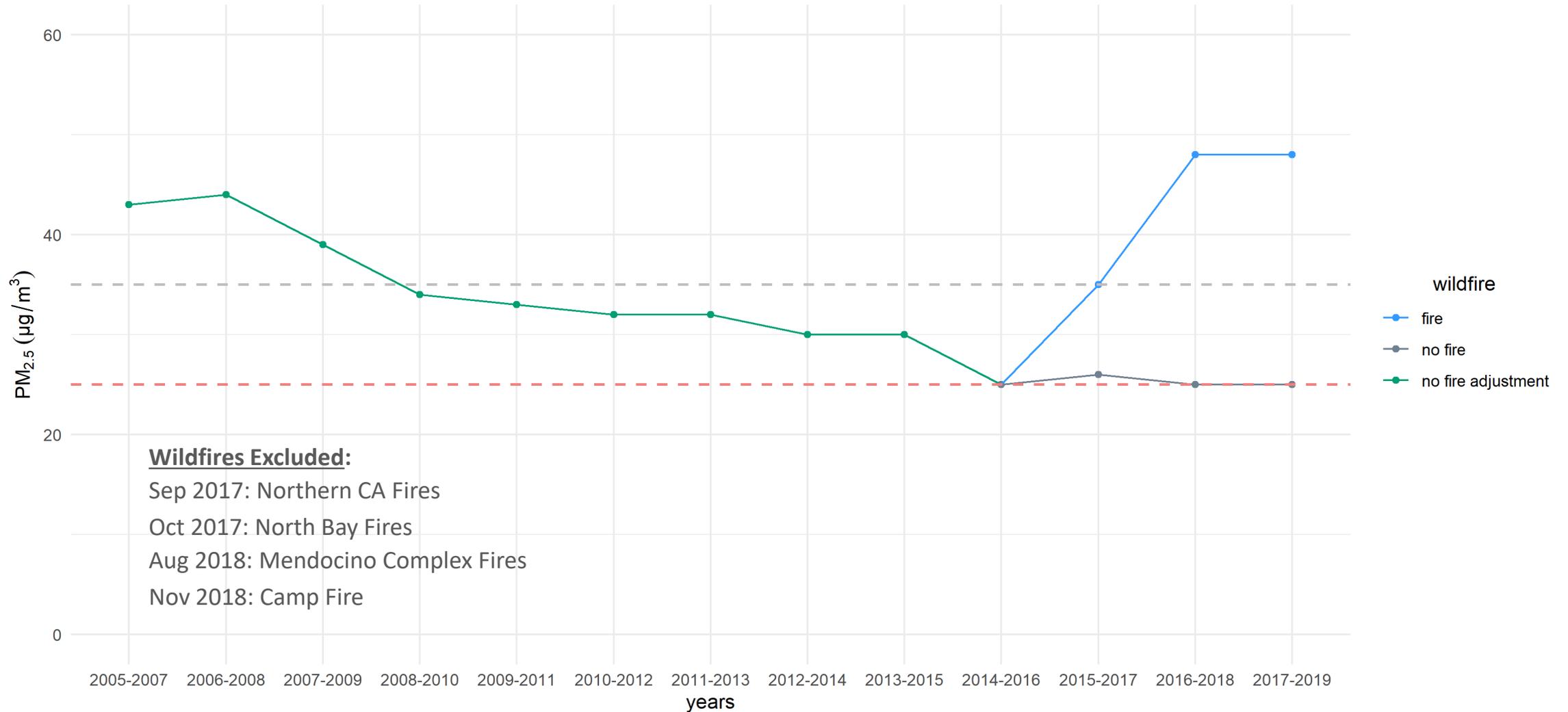
# Design Value Calculation Methodology

## **Design Values (metrics for comparison to NAAQS/CAAQS) are calculated as follows:**

- 2006 24-hour Federal NAAQS = 3-year average of the annual 98<sup>th</sup> percentile 24-hour average concentration (rounded to the nearest whole number: 35.4 = maximum attaining value)
- 2012 Annual Federal NAAQS = 3-year average of annual mean concentration (rounded to nearest tenth: 12.0 = maximum attaining value)
- 2002 Annual State CAAQS = maximum annual mean concentration of the most recent three years (rounded to nearest whole number: 12.49 = maximum attaining value)



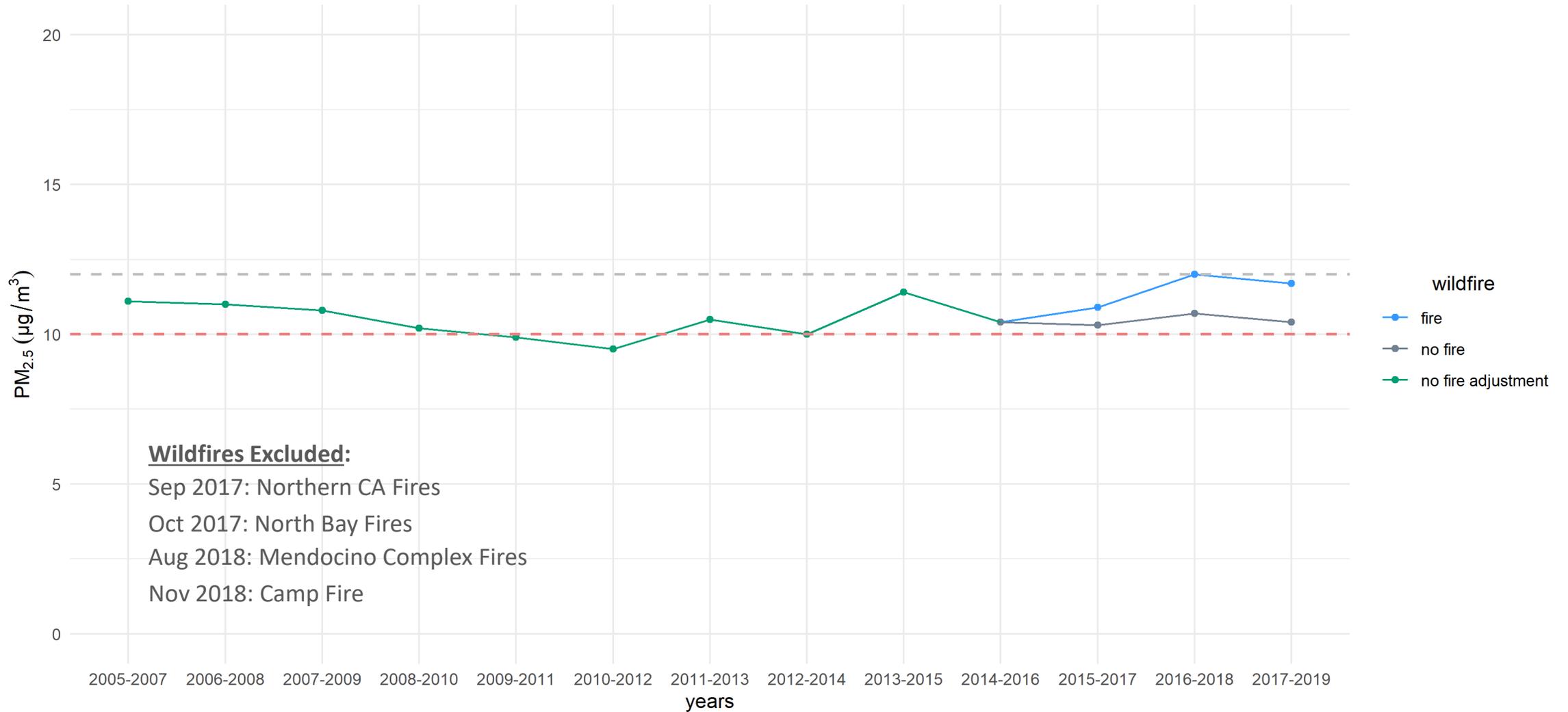
# PM<sub>2.5</sub> 24-hour Trends 2007 - 2019



“fire” and “no fire adjustment” values: see Tables 6a and 6b of EPA’s design value spreadsheet: [https://www.epa.gov/sites/production/files/2020-05/pm25\\_designvalues\\_2017\\_2019\\_final\\_05\\_26\\_20.xlsx](https://www.epa.gov/sites/production/files/2020-05/pm25_designvalues_2017_2019_final_05_26_20.xlsx)  
“fire” values: calculated from hourly Federal Equivalent Monitor (FEM) PM<sub>2.5</sub> concentrations pulled from the Air District’s Data Management System (DMS) on July 29, 2020



# PM<sub>2.5</sub> Annual Trends 2007 - 2019



“fire” and “no fire adjustment” values: see Tables 6a and 6b of EPA’s design value spreadsheet: [https://www.epa.gov/sites/production/files/2020-05/pm25\\_designvalues\\_2017\\_2019\\_final\\_05\\_26\\_20.xlsx](https://www.epa.gov/sites/production/files/2020-05/pm25_designvalues_2017_2019_final_05_26_20.xlsx)  
“fire” values: calculated from hourly Federal Equivalent Monitor (FEM) PM<sub>2.5</sub> concentrations pulled from the Air District’s Data Management System (DMS) on July 29, 2020

# 2017-2019 NAAQS Design Values

Site Name	fire		no fire	
	Annual NAAQS ( $\mu\text{g}/\text{m}^3$ )	24-hour NAAQS ( $\mu\text{g}/\text{m}^3$ )	Annual NAAQS ( $\mu\text{g}/\text{m}^3$ )	24-hour NAAQS ( $\mu\text{g}/\text{m}^3$ )
Sebastopol	7.4	35	6.1	25
Napa	10.4	46	8.7	20
Vallejo	11.2	48	9.6	23
San Rafael	9	42	7.8	23
San Pablo	10.4	44	9.1	22
Concord	10.8	40	9.5	24
Berkeley Aquatic Park†	10.1	42	8.8	22
West Oakland	11.7	45	10.4	24
Laney College†	11.1	45	9.8	22
East Oakland	9.3	44	7.9	20
Pleasanton†	NA <sup>1</sup>	NA <sup>1</sup>	NA <sup>1</sup>	NA <sup>1</sup>
Livermore	8.7	40	7.5	23
San Francisco	9.7	44	8.4	22
Redwood City	8.9	36	7.8	20
San Jose Jackson	10.5	43	9.4	19
San Jose Knox†	10.1	43	9.1	16
Gilroy	6.3	27	5.5	16

- (1) All monitoring sites attain the Annual NAAQS with or without the removal of wildfire-affected data
- (2) Most monitoring sites violate the 24-hour NAAQS when wildfire-affected data are included (“fire” column), but all monitoring sites attain the 24-hour NAAQS with the removal of wildfire-affected data (“no fire” column)

†Near-road monitoring site

<sup>1</sup>The annual and 24-hour values at the Pleasanton monitoring site do not meet the minimum data requirements for design value calculations

Red: Monitoring site design value exceeds relevant NAAQS



# 2017-2019 CAAQS Design Values

Site Name	fire	no fire
	Annual CAAQS ( $\mu\text{g}/\text{m}^3$ )	Annual CAAQS ( $\mu\text{g}/\text{m}^3$ )
Sebastopol	8	7
Napa	<b>14</b>	11
Vallejo	<b>13</b>	10
San Rafael	11	9
San Pablo	<b>13</b>	10
Concord	<b>13</b>	11
Berkeley Aquatic Park†	12	9
West Oakland	<b>14</b>	12
Laney College†	<b>14</b>	11
East Oakland	12	9
Pleasanton†	<b>14</b>	10
Livermore	11	8
San Francisco	12	9
Redwood City	11	8
San Jose Jackson	<b>13</b>	10
San Jose Knox†	12	10
Gilroy	8	6

(1) Some monitoring sites violate the Annual CAAQS when wildfire-affected data are included (“fire” column), but all monitoring sites attain the annual CAAQS with the removal of wildfire-affected data (“no fire” column)

†Near-road monitoring site

**Red:** Monitoring site design value exceeds relevant NAAQS